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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/916,211	07/25/2001	Russell Howard Barton	130109.407	6847

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EXAMINER	
CREPEAU, JONATHAN	

ART UNIT	PAPER NUMBER
1746	

DATE MAILED: 10/20/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/916,211	BARTON ET AL.	
	Examiner	Art Unit	
	Jonathan S. Crepeau	1746	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 July 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2-20,22,27,29-34,36-38,40,41 and 43* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *11-13,16-20,22 and 38* is/are allowed.

6)☒ Claim(s) *2-6,9,10,14,15,27,29-31,33,34,36,37,40,41 and 43* is/are rejected.

7)☒ Claim(s) *7,8 and 32* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. This Office action addresses claims 2-20, 22, 27, 29-34, 36-38, 40, 41 and 43. Claims 11-13, 16-20, 22, and 38 are allowed and claims 7, 8 and 32 are objected to as containing allowable subject matter. Among claims 2-6, 9, 10, 14, 15, 27, 29-31, 33, 34, 36, 37, 40, 41, and 43, some of the claims remain rejected for the reasons of record and others are newly rejected as necessitated by amendment. Accordingly, this action is made final.

Claim Rejections - 35 USC § 102

2. Claims 14 and 33 are rejected under 35 U.S.C. 102(e) as being anticipated by Sawyer (U.S. Patent 6,569,549). The reference is directed to a system and method for purging a fuel cell stack (see abstract). The fuel cell stack comprises a purge valve (30), an actuator for opening and closing the valve, and a controller (32) for controlling the actuators (see Fig. 3). The controller actuates the purge assembly upon the measurement of a process parameter (e.g., nitrogen concentration) reaching a purging condition value (see col. 8 line 50 et seq.). The fuel cell is purged in pulsed manner until the value of the measured parameter is reduced below a threshold value (see Fig. 7). The duration of the purge pulse is determined based on the current density of the fuel cell stack (see col. 7, line 51 et seq.); therefore, the durations of the pulses may be the same or different.

Thus, the instant claims are anticipated.

Claim Rejections - 35 USC § 103

3. Claims 36 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sawyer. The reference is applied for the reasons stated above. Further, regarding claim 36, the reference teaches that the purge valve is opened during startup of the fuel cell (see col. 8, line 23).

However, the reference does not expressly teach that the purge valve is also opened during a shutdown of the fuel cell stack, as recited in claim 36, or that the controller contains a computer-readable media containing instructions for causing a processor to control the fuel cell system, as recited in claim 41.

However, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to open the purge valve of Sawyer during shutdown of the fuel cell stack. Such a purging step would leave the system in a state more conducive to starting up; i.e., the system would be more "ready" to be started up. Furthermore, the purge valve may be operated on a "timed schedule" (col. 6, line 18), which timed purges would be dispersed throughout the operation of the system, i.e., during startup, steady state operation, and shutdown. Accordingly, the subject matter of claim 36 would be rendered obvious to the skilled artisan.

Regarding the computer-readable media containing instructions for causing a processor to control the fuel cell system, as recited in claim 41, this subject matter would also be obvious to the skilled artisan. In column 2, line 17, Sawyer teaches that conventional PEM fuel cell assemblies contain "a microprocessor that controls the operation of the fuel cell power plant." Such microprocessors are routinely controlled by instructions which reside in a computer-

readable memory area of the controller, e.g., a read-only memory (ROM). Accordingly, the artisan would be motivated to use such a configuration in the system of Sawyer to efficiently and precisely control the operation of the system.

4. Claim 40 is rejected under 35 U.S.C. 103(a) as being unpatentable over Strasser et al (U.S. Patent 3,935,028).

Strasser is directed to a fuel cell stack (see abstract). The fuel cell stack comprises purge valves (63, 64), an actuator for opening and closing the valves, and a controller (32) for controlling the actuators (see Fig. 2; col. 5, line 10 et seq., col. 7, line 31). The fuel cells in the stack are cascaded, and the voltage of the last cell (i.e., the "purge" cell) is measured and compared to an average voltage of the cell stack (see col. 5, line 10 et seq). When the voltage of the purge cell reaches a threshold voltage (i.e., a defined percentage of a threshold voltage of the entire stack), purging of the fuel cell is actuated and the purge is sustained for a determined period of time.

However, the reference does not expressly teach that the purge valve is closed when the average purge cell voltage rises above a second defined percentage of the average fuel cell voltage, as recited in claim 40.

However, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to close the purge valve as quickly as possible in hopes of not purging viable reactant material out of the

system, while still obtaining a sufficient voltage rise. Thus, a control scheme utilizing a threshold voltage being equal to the first threshold voltage to automatically stop the purging would be obvious to the skilled artisan.

5. Claims 2-6, 9, 10, 15, 27, 29, 30, 31, and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sawyer in view of Strasser.

Sawyer is applied to claims 14 and 33 for the reasons stated above. However, the reference does not expressly teach that a voltage is measured across a purge cell portion of the stack and compared to the entire stack voltage, and that the stack is purged accordingly, as recited in claims 5, 15, 29, and 34.

As set forth above, Strasser teaches a fuel cell system wherein the purging of the fuel cell is based on the voltage of a purge cell portion as compared with the average voltage of the fuel cell.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to incorporate the voltage measurements of Strasser into the control scheme of Sawyer. As discussed in Sawyer, nitrogen accumulates throughout the anode flow field of the fuel cell and is measured at a point near the outlet of the system. Similarly, in column 5, line 10, Strasser teaches that "[i]n this process, inert-gas components accumulate in the last stage of the cascade, which for instance, consists of one cell, whereby the voltage of the last stage of the cascade drops." Thus, it is seen that a voltage measurement of the purge cell of Sawyer would be analogous to a

nitrogen concentration measurement, as the nitrogen concentration adversely affects the voltage. Accordingly, the artisan would be motivated to use the voltage measurements of Strasser in the system of Sawyer, as these measurements are easy to make with voltage sensors and produce a result which is a direct measure of the performance of the system.

However, neither Strasser nor Sawyer expressly teach that that purge cell portion comprises at least two cells, as recited in claim 9, that an "average" purge cell voltage is measured (claim 4), that the defined first percentage of the average fuel cell voltage is approximately 90% (claims 10 and 27), or that the purge valve is closed when the average purge cell voltage rises above a second defined percentage of the average fuel cell voltage (claims 6 and 31).

However, the artisan would first be motivated to use a plurality of fuel cells as the purge cell portion of Sawyer, as recited in claim 9. In column 5, line 11, the Strasser reference teaches "the last stage of the cascade, which for instance, consists of one cell." Thus, the reference does not limit the purge cell portion to just one cell. Furthermore, the duplication of parts generally is not considered to patentably distinguish over a reference (MPEP 2144.04(VI)). Regarding claim 4, upon using a plurality of fuel cells in the purge cell portion, the artisan would be motivated to use an average voltage measurement of the cells in the purging control scheme.

Furthermore, although Strasser and Sawyer do not expressly teach that the purge valve is closed when the average purge cell voltage rises above a second defined percentage of the average fuel cell voltage (claims 6 and 31), this configuration would be obvious to one of ordinary skill in the art for the reason set forth in section 4 above. The artisan would be motivated to close the purge valve as quickly as possible in hopes of not purging viable reactant

material out of the system. Thus, a control scheme utilizing a threshold voltage to automatically stop the purging would be obvious to the skilled artisan.

Regarding the limitation the defined first percentage of the average fuel cell voltage is approximately 90% to initiate purging (claims 10 and 27), this limitation would also be rendered obvious to the skilled artisan. The artisan would be able to manipulate the threshold voltage for initiating purging so as to result in a system that is efficient as possible. It has been held that the discovery of an optimum value of a result effective variable in a known process is ordinarily within the skill of the art. *In re Boesch*, 205 USPQ 215 (CCPA 1980). Thus, the claimed value of 90% is considered to be obvious to the skilled artisan.

6. Claims 37 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sawyer as applied to claims 36 and 41 above, and further in view of Strasser.

Sawyer does not does not expressly teach that a voltage is measured across a purge cell portion of the stack and the stack is purged accordingly, as recited in claims 37 and 42.

As set forth above, Strasser teaches a fuel cell system wherein the purging of the fuel cell is based on the voltage of a purge cell portion as compared with the average voltage of the fuel cell.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to incorporate the voltage measurements of Strasser into the control scheme of Sawyer. As discussed in

Sawyer, nitrogen accumulates throughout the anode flow field of the fuel cell and is measured at a point near the outlet of the system. Similarly, in column 5, line 10, Strasser teaches that "[i]n this process, inert-gas components accumulate in the last stage of the cascade, which for instance, consists of one cell, whereby the voltage of the last stage of the cascade drops." Thus, it is seen that a voltage measurement of the purge cell of Sawyer would be analogous to a nitrogen concentration measurement, as the nitrogen concentration adversely affects the voltage. Accordingly, the artisan would be motivated to use the voltage measurements of Strasser in the system of Sawyer, as these measurements are easy to make with voltage sensors and produce a result which is a direct measure of the performance of the system.

Response to Arguments

7. Applicant's arguments filed July 19, 2004 have been fully considered but they are not persuasive insofar as they apply to the present rejections. Regarding the Sawyer reference, Applicants state that "Sawyer does not teach determining the current through the fuel cell stack or determining the duration of the purge based on the determined current through the fuel cell stack." However, Sawyer's disclosure in column 7, line 51 is still considered to be anticipatory of this claim language. The passage states that "[a]s discussed above, the duration of the purge pulse is dependant upon the specific type of the fuel cell power plant in use, as well as the purge rate of the purge pulse and *current density* at which the cell stack assembly of the fuel cell power plant is being operated [emphasis added]." It is submitted that the knowledge of the value of the current density would inherently involve the knowledge of the amount of current flowing

through the stack. The claims do not specify that the current must be measured repeatedly or that each purge duration is separately determined based on an individual measurement. As such, Sawyer is still considered anticipatory of the limitations relating to current measurement. It is further noted that if such language is presented after final rejection, it may be considered to raise a new issue.

Regarding the Strasser reference, Applicants state that this reference does not teach or suggest using a second threshold voltage for closing the purging valve (i.e., determining the purge duration). However, it is still believed that this limitation would be obvious over Strasser. In column 5, line 13, Strasser teaches that "[t]hrough comparison with the average cell voltage, a singal [sic] is obtained which is used electronically to open an valve, whereby the inert components are purged as the voltage rises again. The purging device is protected against failure by monitoring the battery [i.e., fuel cell] voltage." The last sentence is believed to fairly suggest using the measured voltage to control the duration of the purge. Furthermore, Applicant's argument that the threshold voltages are different is not persuasive with regard to claim 6 because this limitation is not recited in the claim (claims 7, 8 and 32 are allowable as noted below, however).

Allowable Subject Matter

8. Claims 11-13, 16-20, 22, and 38 are allowed.

9. Claims 7, 8, and 32 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

10. The following is a statement of reasons for the indication of allowable subject matter:

Independent claims 11, 16, and 38 each recite a purging sequence comprising opening and closing the purge valve multiple times in response to the existence of a purging condition. The claims further recite an "inter-purge duration" before any subsequent purge can be performed. Applicant's arguments regarding these claims are persuasive as neither Herron nor Sawyer is seen to fairly suggest multiple purge pulses in response to a single trigger condition or an "inter-purge duration" which must be maintained even when the purging condition exists.

Regarding dependent claims 7, 8, and 32, Strasser does not fairly suggest using a different voltage threshold than the first voltage threshold for closing the purge valve. As such, these claims also contain allowable subject matter.

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, THIS ACTION IS MADE FINAL. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after

the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Crepeau whose telephone number is (571) 272-1299. The examiner can normally be reached Monday-Friday from 9:30 AM - 6:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Barr, can be reached at (571) 272-1414. The phone number for the organization where this application or proceeding is assigned is (571) 272-1700. Documents may be faxed to the central fax server at (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jonathan Crepeau
Primary Examiner
Art Unit 1746
October 18, 2004